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Final Report on NASA Grant NAGW5-7258: MAMI: Modeling of the Magnetosphere-Ionosphere-Atmosphere System.

15 April to 15 October 1998

This grant covered the transition period between the ISTP/GGS main mission MAMI work (NAGW5-1097) to the extended mission of GGS/SolarMax. During this period we concentrated on the following subjects:

- Ionospheric modeling and in particular the coupling of the ionosphere and the magnetosphere require knowledge of the ionospheric conductances. We have an algorithm to derive these conductances from POLAR UVI or POLAR VIS images. The image analysis requires carefully calibrated measurements, separation of auroral brightness from scattered solar EUV and emissions caused by photoelectrons, and modeling of the auroral conditions. Under this grant we evaluated the various sources of uncertainty that contribute to the conductance calculation by comparing different model approaches and we conducted sensitivity studies.

- A joint modeling effort between our ionospheric models and a global MHD magnetospheric model with S. Slinker and J. Fedder lead to improved parameterizations for the MHD model. The predictions of that new model were validated using data from ground based instruments, POLAR UVI images, and DMSP satellites. These findings were presented at the GEM meeting in Snowmass, and at the Huntsville modeling workshop in Guntersville. A manuscript for publication is in preparation.

- A study to evaluate the thermospheric effects of large substroms and storms was conducted with the TIE-GCM model. Of particular interest are compositional changes of the thermosphere in the southern hemisphere. Southern hemisphere effects are stronger than those on the northern hemisphere because of the larger offset of the magnetic dipole from the rotational axis. These results were presented at the Huntsville modeling workshop in Guntersville.

- The home-page for MAMI on the World Wide Web at URL

  `http://loke.gi.alaska.edu/mami.html`

  is regularly updated. This set of pages describes the theoretical background, modeling procedure, and gives examples using existing data. We use the web to exchange data with collaborators and maintain pages for each event that we have been studying. We also maintain a list of publications on this web site.

- Meetings and Conferences:

  - The ISTP/GGS Science Team Meeting at the Rutherford Appleton Laboratory in Abingdon, UK (September 23-26, 1998) was attended by D. Lummerzheim and M. H. Rees. D. Lummerzheim chaired a session on "The evolution, with altitude, of phenomena observed on high latitude auroral flux tubes" jointly with D. Klumpar.

  - The Sixth Huntsville Modeling Workshop in Guntersville (26-30 October 1998) was attended by D. Lummerzheim and M. H. Rees.

- Conference presentations:

  Lummerzheim, D., R. G. Roble, and G. Lu, (invited) Data Driven Global Thermospheric Modeling, Sixth Huntsville Modeling Workshop, October 1998.

  Lummerzheim, D., J. Spann, and G. Parks, (invited) Global Imaging Mission, Sixth Huntsville Modeling Workshop, October 1998.

  Slinker, S., J. Fedder, B. Emery, K. Baker, D. Lummerzheim, J. Lyon, and F. Rich, Comparison of MHD simulations of the ionosphere and magnetosphere with AMIE analysis and spacecraft measurements for May 19-20, 1996, Sixth Huntsville Modeling Workshop, October 1998.

- Submitted papers:

  Lu, G., A. D. Richmond, Y. Kamide, D. Lummerzheim, M. Brittnacher, and G. K. Parks, Global ionospheric convection during substorm expansion, *Proc. 4th Internat. Conf. on Substorms, in press*, 1998.